Experimental study on gas generation potential of marine source rock with high maturity

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The ancient marine source rocks in basins of west China have endured lengthy process of thermal evolution, which makes them have a relatively high degree of maturity. According to analysis of available data, a fair number of liquid hydrocarbons, account for 40%-60% of total, still remain in source rocks within oil window. And these hydrocarbons can crack into gas at high mature stage, serving as an important source of some gas pools found in deep formations. In this way, the deep formations will have great resource potential. In order to assess the amount of dispersive liquid hydrocarbons resident in source rocks, a simulation of marine marl with low organic matter abundance under different fluid pressures were carried out.

The sample used in these experiments is from a core of Pando-X1 well from Madre de Dios Basin in Bolivia. It is of Devonian age, and at this locality it is thermally immature in the pre-oil generation. The collected sample is a marine marl with an organic carbon content of 0.95 wt %. The sample was crushed into gravel-sized chips. Reflectance measurements on vitrinite macerals found dispersed in the kerogen gave a mean %Ro of 0.59. All of the experiments were conducted in stainless-steel. The temperature is set at 290°C, 310°C, 330°C,350°C and 370°C, while the pressure obtained at each temperature was set at 10MPa and 20MPa respectively.

The results indicated that, the peak time of hydrocarbon generation and expulsion was around 310°C under the pressure of 10MPa, with the expulsive oil rate and the total oil yielding rate of 182.5mg/g and 193.4mg/g, respectively. Under 20MPa, the temperature corresponding to the hydrocarbon generation and expulsion peak was about 330°C, with the expulsive oil rate and the total oil yielding rate of 92.4mg/g and 111.4 mg/g, respectively. It has been suggested that, the increase of pressure represses the thermal evolution of organic materials. It enlarges the effective hydrocarbon expulsion stage of source rocks in addition to postponing the major expulsion period. As a result, the residence time of resoluble organic materials with large quantity has been enlarged, which provides material basis for the generation of gas during the high evolutionary phase.

Metal zoning feature and its Genesis of Bairendaba vein type ore forming system in Inner Mongolia, China

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Bairendaba Zn-Pb-Ag deposit is located in Inner Mongolia, China, and is a large scale vein type deposit with more than 4 000 tons of Ag and 2M tons of Zn+Pb.

The deposit is hosted in faults system of Carboniferous quartz diorite. There are More than 68 veins are found in the deposit, most of them are dip to the north. The No. 1 and No. 3 veins are the main orebodies and host more than 77% metal reserves of Bairenda[1]. Hydrothermal alterations closed to orebodies are well developed, including silicification, chloritization, epidotization and minor sericitization. The mainly ore minerals occurred in the deposit are marmatite, pyrrhotite, galena, with minor chalcopyrite, arsenopyrite, pyrite, Ag-bearing tetrahedrite and sulfosalts. The most common gangue minerals are quartz and fluorite.

The orebodies show obvious mineralization zoning feature, with Cu-bearing ores in the center and high grade Ag-bearing ores in the outer of the deposit. There is a systematic variation of metal grades, metal ratios and metal tonnage in the most economic No. 1 vein along its trend as it is divided into equidistant blocks by the cross sections.The tonnage and grade of zinc in each ore block decrease from west to east, the tonnage and grade of lead and silver of each ore block increase first and then decrease gradually. The Ag/Pb ratio of each block decrease first and then increases gradually, while the Ag/Zn and Pb/Zn ratios increase gradually all the time.

We propose that this metal zoning feature and systematic variation of metals is a reflection of decreasing temperature of ore forming system from west to east, and is the consequence of mixture of high temperature ore forming fluid with cold meteoric water in the fault system.

[1] Liu et al. (2012) Journal of Jilin University (Earth Science Edition), 42(4),1055-1068.

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